FOREST RESEARCH DIGEST

JULY 1935

FOREST RESEARCH DIGEST

JULY 1935

LAKE STATES FOREST EXPERIMENT STATION*

Forest Service U.S. Dept. Agr.

SOCIAL RESPONSIBILITIES OF SCIENTISTS

"Science in the Service of Society" was the title of the speech prepared by Chief Forester Silcox for presentation at the Semi-Centennial celebration of the Minnesota Agricultural Experiment Station on June 15. Due to unforseen circumstances Mr. Silcox was unable to be present and the speech was delivered by Earle H. Clapp, Assistant Forester of the Division of Research.

The speech clearly brought out the obligation which science owes to society. Scientists and research workers in particular have often been blind to the greater needs of men. As his work becomes more and more specialized, the boundaries of the scientist's mind are apt to include an ever narrowing field of vision. When a man looks through a microscope he sees an infinite amount of detail in the particular object being viewed but the eye must be taken from the eyepiece and the mind allowed to orient the detail in a field much larger than that of the microscope in order that what is seen may have real significance. Many scientists begin their work inspired by a vision of service but as they advance in the technicalities of their problem, its demands on their mental faculties become insistent and the vision is lost. Such is not true of all scientists and most certainly not of the really great ones. The great scientists never lost sight of the larger goal of man's work - a more abundant life for all. Even lesser scientists will do greater work if they occasionally lift their eyes and scan the wide horizon of social service.

---

*Maintained in cooperation with the University of Minnesota at University Farm, St. Paul, Minnesota.

LARGE SCALE CONVERTING FACTORS

The conversion of board feet to cords and vice versa presents certain difficulties because the converting factor changes with the size, species, and roughness of the pieces. In making the conversion for a small amount of material, these factors can be evaluated and the proper allowance made by using a table of converting factors such as is presented on page 6 of the "Forest Research Digest" for May, 1935. However, when it becomes necessary to make the conversion for a large volume of material composed of an unknown mixture of sizes and shapes, it is almost impossible to determine the proportion of material which falls into the various classifications. In such cases it is usual to fall back on the commonly accepted standard of two cords per thousand board feet.

However, measurements by the Forest Survey on the general run of sawtimber stands in Minnesota, show that this factor is too low. The following table gives average converting factors applicable to large volumes of timber which are representative of the general conditions found in Minnesota.

Table of Converting Factors

Species	Cubic Feet Per M. bd. ft. (Scribner)	Cords Per M. bd. ft. (Scribner)*
Jack Pine	210.5	2.8
White Pine	176.2	2.35
Norway Pine	176.2	2.35
Mixed Hardwoods	182.7	2.4
Aspen	195.0	2.6
Balsam Fir	193.8	2.6
Spruce	222.7	3.0
All Species	192.1	2.6

The average volume of 192.1 cubic feet or 2.6 cords per thousand feet Scribner is weighted according to actual distribu-

* A conversion factor of 75 cubic feet per cord has been found most applicable to the sawlog sections of merchantable trees in Minnesota.

tion of present sawtimber stands between species and diameters. A cubic foot of round sawlog material is thus approximately equivalent to 5 board feet log scale.

VEGETATIVE REPRODUCTION OF PIN CHERRY

Observations upon a generally unsuspected method of reproduction of the pin cherry (*Prunus pennsylvanica*) have been made by E. I. Roe in the course of ecological investigations in the northern part of lower Michigan. Information on reproductive habits is of special interest in the case of species forming inferior forest types which it is desired to convert into more useful types. The pin cherry type, although not nearly as important as many of the other Lake States cover types, occupies a considerable area of cut-over land in the region.

Foresters have generally assumed that the extensive stands of pin cherry which often follow logging and fire in hardwood stands arise from seed distributed by birds. It is exceedingly doubtful, however, if the dominance of this tree over large areas can be wholly attributed to this mode of origin. That "suckering" may play a prominent role in the reproduction of this species is suggested by a small group of pin cherries seen near East Tawas, Michigan. The trees, which were fifteen to twenty feet in height, occurred in the form of a hollow circle about forty feet in diameter. Upon closer examination to determine the reason for this strange grouping, it was found that the trees had a common root system. Although this single case does not give conclusive evidence of the importance of suckering in the pin cherry, it does suggest that the role of birds as seed disseminators may not be as large as is generally believed.

SHELTERBELT REPORT

The report of the shelterbelt investigations begun last fall has been completed and sent to Washington to be printed. It represents the work of a number of scientists in several fields. The report includes chapters on the climate, the natural vegetation, the soils, the condition of existing shelterbelts, the benefits of shelterbelt planting and the experimental work done in this country and abroad. Fifty-four maps and charts were used to illustrate the findings. The information gained in this survey will form the basis for future planting in the Prairie-Plains region.

WHAT FACTORS REDUCE PLANTATION SURVIVAL?

To the forester it is almost as important to learn what kills trees as it is to know how many trees died. Yet systematic observations to show the causes of loss of planted trees have been singularly lacking. This is largely due to the fact that constant observations are necessary to determine causes of loss accurately, since the clues are often obliterated relatively shortly after the injury has occurred; and there have been few intensive planting studies.

One phase of a large scale planting experiment being conducted by the Lake States Forest Experiment Station on the Huron National Forest in lower Michigan under the direction of P. O. Rudolf, is concerned with the determination of causes of loss. Although results are still of a preliminary nature, the following tables are presented because of the interest attached to such information.

1932 Plantings (Subject to severe drought of 1933, severe winter of 1933–34, and moderate drought of 1934)

Causes of Loss	Percentage of Total Loss
Drought and heat	86.9
Undetermined	4.5
Grubs	3.8
Smothering	2.4
Others - Poor root system, small stock, tip injury, nipping, grouse damage, bud injury, trampling, freezing, tip moth, and poor planting.	2.4

1933 Plantings (Subject to severe winter of 1933-34 and moderate drought of 1934)

Causes of Loss	Percentage of Total Loss
Undetermined	33.9
Freezing	22.4
Drought and heat	19.1
Smothering	12.7
Grubs	8.0
Small stock	1.3
Poor planting	1.0
Others - Poor root system, trampling, uprooted, nipping, grouse damage, tip injury, and tip moth.	1.6

The values in these tables are average results for four species of pine (Norway, white, jack, and Scotch) and four classes of stock (1-0, 2-0, 1-1, and 2-1), and represent, not actual losses, but the relative importance of several causes of loss.

EFFECT OF COLD STORAGE ON GERMINATION

The beneficial effect of cold storage on the germination of noble fir (*Abies nobilis*) seed has been pointed out by an experiment conducted by the Pacific Northwest Forest Experiment Station.*

Comparable samples of noble fir seed were stored at room temperatures and at 15°F. The samples were tested annually for germination over a period of five years. The study was begun in 1921 and repeated beginning 1926. The seeds stored at room temperature showed normal germination the first spring following collection, but after the first year showed no further germination; the seed held in cold storage germinated each year for the entire five year period but the maximum germination was obtained at the end of four years of cold storage in both the original and the repeat experiment.

The possibility of successfully storing forest tree seed

* Isaac, Leo A., "Cold Storage Prolongs the Life of Noble Fir Seed and Apparently Increases Germinative Power." Ecology Vol.XV, No. 2, April, 1934.

of species useful for planting is of considerable interest since in some species good seed years occur at rather infrequent intervals and some means of seed storage therefore becomes necessary in order to meet annual planting needs. The method described for noble fir appears to meet the requirements.

WINTER HABITS OF DEER

During the past winter a study of the habits of deer was made by a C.C.C.worker, under the direction of R. K. LeBarron. Several days were spent in following individuals and groups of deer and making systematic observations. Two different areas on the Kawishiwi Experimental Forest were covered; in one area C.C.C. men were engaged in cleaning up windfalls; in the other no men were working.

The observations indicated that deer do not stay in the swamps and that when they cross such areas they travel in a direct route instead of following a wandering course which is their habit when traveling in upland country. The animals do not travel very far and they bed frequently. In one case, the deer traveled less than 1/2 mile and bedded five times during the course of 24 hours. All of the bedding places observed were under coniferous trees and usually on the south or southeast side of the trees.

When the deer traveled in groups, they followed one another in single file, and did not step off their trail to feed. This means that the animals traveling in front probably got the most and the choicest feed. They ate whatever could be reached from their position on the trail and since hazel was the most abundant shrub, this furnished the chief item of diet.

In view of the considerable criticism of the effect of the presence of C.C.C. workers on game populations, it is extremely interesting to note that more deer were observed in the area where the C.C.C. work was being conducted than in the undisturbed area. The most likely explanation is that easier traveling, as a result of the trampling of the snow by the workers, led the deer to prefer the inhabited area. Lack of snow cover might, of course, change this condition.

EFFECTS OF FOREST ON NITRIFICATION OF THE SOIL

Translation* by the Division of Silvics in Washington has made available the findings of a Russian study of soil nitrification. Some of the conclusions reached are of interest in that they present ideas which have considerable bearing on forest management practices.

One observation in particular is valuable. An increase in the nitrifying activity of the soil is said to encourage the growth of hardwoods and herbaceous vegetation more than that of coniferous stands. An increase in nitrification may sometimes even indirectly be injurious to conifers because of the stimulating effect on the growth of competing hardwood and herbaceous species. The author, however, states that the available data regarding this particular phase of the subject are not sufficient to give a final answer.

Most of the work consisted of the investigation of the effect of species composition and fires upon the nitrifying activity of the soil. In pure pine stands with a vegetative cover made up chiefly of heather, lichens and mosses, nitrification of the soils does not take place under the shelter of the forest or even following cutting. In stands of nearly pure spruce where the ground cover is characterized by *Oxalis acetosella*, nitrification of organic nitrogen can take place but only following fellings. The soils in uncut, mixed stands of spruce, birch and aspen are subject to active nitrification.

Fire was found to have a marked effect in increasing the nitrification of forest soils of all stands. After burning, nitrification will begin on soils where it had not occurred before. The effect is sometimes noticeable almost immediately following moderate burning (2 days). A running fire, burning moderately, is more favorable to nitrification than the burning of brush in piles. These effects are worthy of consideration when plans for cutting are being made, inasmuch as nitrification appears to exert an influence on the composition and growth of the developing stand.

---

*Nitrifikatsia V Lessnykh Pochvakh V Zavissimosti Ot Sostava Nasjdenia, Rubki I Ognevoi Ochistka Lessosek by N. N. Sushkina.

SCIENCE MEETINGS

The annual summer meetings of the American Association for the Advancement of Science and associated societies were held at the University of Minnesota during the week of June 24-29. Scientists in all fields attended and discussed their latest findings. The day-time meetings were conducted by each of the several societies such as the Plant Physiologists, the Meteorologists, the Ecologists, Botanists, and so forth. Each evening a single large meeting was addressed by a prominent scientist.

Several members of the Experiment Station staff presented papers before the American Society of Plant Physiologists and the American Meteorological Society. H. L. Shirley described some seed problems of the forester; P. L. Fisher explained the results of the seed testing work which was greatly expanded during the winter in order to meet the needs of the enlarged Regional planting program and the proposed shelterbelt plantings. He described various pre-germination treatments which were used to overcome the resistance of certain species. J. M. Aikman described some ecotypes of green ash. An ecotype is a plant having certain characteristics which are the result of local environment and when the plant is moved from one environment to another, the characteristics change. Such factors are important in the early establishment of planting stock. These three addresses were presented before the American Society of Plant Physiologists.

H. L. Shirley also explained the effect of light on the growth of plants in the forest. This talk was given in a meeting of the American Meteorological Society.

PRE-GERMINATION TREATMENTS FOR LAKE STATES TREES

The methods of storing and treating tree seeds in order to obtain a high percentage of germination in a short time are known for some of the species commonly planted in nurseries. In connection with the Regional planting program some species were used for which little germination data was available. New contributions to the knowledge of seed germination have been made for several species.

Jack pine (*Pinus banksiana*), was found to germinate 83 percent with no pretreatment as against 91 percent after stratification

in moist sand at 5°C. for two months. The actual germination of treated seeds is much more rapid than that of untreated seeds. Treated seeds germinated 83 percent in 14 days after planting while it took untreated seeds 61 days to reach the same percentage. The difference of 8 percent between the final germination percentages may not be sufficient to warrant the added time and labor involved in the pretreatment, however. Ponderosa pine (*Pinus ponderosa*), followed the same general trend. Stratification at 5°C. for two months brought the percentage up slightly over the untreated seeds. Untreated seeds germinated 58 percent in 64 days while treated seeds reached 58 percent in 11 days after planting. Planting of non-treated seeds is recommended for this species. Norway pine (*Pinus resinosa*), likewise requires no pretreatment: 90 to 93 percent germination being obtained with good seed. Norway pine stratified 5°C. for two months did not germinate quite as well as untreated seeds in the same time.

These three pines have neither seed coat nor embryo dormancy,(Forest Research Digest, May 1935). This characteristic, however, does not necessarily indicate the germination behavior, since hemlock and arbor vitae, two other coniferous species also having no dormancy, gave very different results. Untreated seeds of hemlock (*Tsuga canadensis*), germinated 41 percent while seeds stratified at 5°C. for two months germinated but 12 percent. Arbor vitae (*Thuya occidentalis*), germinated 43 percent untreated, as against 14 percent after stratification at 5°C. for 2 months.

With white pine (*Pinus strobus*), a seed having embryo dormancy, stratification at 10°C. for 25 days (87 percent germination) proved more effective than stratification at any other temperature or untreated seeds (9 percent). White spruce (*Picea glauca*), another species having embryo dormancy germinated 70 percent, and higher with some samples, after stratification at 5°C. for two months. Treatments at 5°C. for one month, 2°C. for one month and 2°C. for two months yielded germinations from 64 percent to 41 percent but all germinated better than the untreated seeds (11 percent).

The standard 5°C. for three and a half months stratification for eastern red cedar (*Juniperus virginiana*), proved to be the best treatment so far. Various other stratifications, scarifications, and gaseous treatments were ineffective. Species of Juniperus are in need of further experimentation to determine the opti-

mum treatment.

More work is also needed on most of the species which are of special interest in planting for game food.

The germination of smooth sumac (*Rhus glabra*), a seed possessing both seed coat and embryo dormancy, was helped by sulfuric acid treatment to make the seed coat permeable, followed by storage to allow for the after-ripening of the embryo. Seeds soaked in sulfuric acid for 20 minutes and stored dry one month germinated 39 percent in 9 days, the same acid treatment with no storage gave 25 percent in 25 days, and the average germination of untreated seeds was 4 percent. Tests with longer storage periods are now under way.

Satisfactory germination was not secured with mountain ash (*Sorbus americana*), although stratification at 5°C. for three months was found to be most effective.

Stratification at 2°C. was the most satisfactory treatment for chokecherry (*Prunus virginiana*).

For wild plum (*Prunus americana*), stratification at 5°C for 2 months and at 5°C. for 3 months were equally as effective. Treatments of 5°C. for one month, -5°C. for one and three months, were ineffective, and the untreated seeds did not germinate satisfactorily either.

Bur oak (*Quercus macrocarpa*), germinated 48 percent when treated with ethylene-chlor-hydrin gas for 10 days as against 22 percent germination for untreated acorns.

The germination of black walnut (*Juglans nigra*), was hastened by 15 days after treatment with amylene gas for 10 days, but untreated seeds gave the same percentage of germination.

DYE TEST FOR GERMINATION

The determination of the germination percent of seed is a lengthy process as ordinarily conducted, 60 to 90 days being the usual time required. A Russian scientist* has been experimenting with a dye test which promises to materially shorten the period necessary to determine seed quality. The test is based on the fact that certain dyes in the proper concentration will stain dead tissue but not living. By treating the seeds with indigo-carmine for various lengths of time, it was found that the proportion of the seeds which were unstained or only

---

*Translation from a Russian article by E. Y. Shafer-Safronova, M. I. Kalashnokova and A.S. Kostromina.

slightly stained in certain restricted areas agreed quite closely with the germination percent as determined by the usual sprouting method. Seeds of different species behave quite differently, and it is necessary to work out proper methods for each. The work so far done is of a preliminary nature and much needs to be done before the method can be definitely established. Professor R. B. Harvey of the University of Minnesota has begun a similar experiment with Osage orange seed, but as yet no results are available.

SILVICULTURAL EFFECTS OF RELEASE CUTTINGS IN PLANTATIONS OF WHITE AND NORWAY PINE*

By L. J. Young** and F. H. Eyre***

A large portion of the pine lands of the Lake States has been taken over by oak or aspen. Since there is at present little commercial use of these species, considerable effort is now being made to replace them with pine and other conifers, or at least to introduce conifers in mixture with the second growth. Many such coniferous plantations in the region, including some made under a cover of larger trees of inferior species and others in open areas, have been suppressed by competing vegetation. The survival in some of these plantations has been satisfactory but their growth has been disappointingly slow.

Experimental release cuttings in such plantations of white pine on the Higgins Lake State Forest in lower Michigan were begun by the Michigan School of Forestry and Conservation in cooperation with the Lake States Forest Experiment Station in 1928. Similar plots were established on the Fife Lake State Forest, Michigan, the following year. In 1931 cuttings to release Norway pine from aspen competition were established on the Superior National Forest in Minnesota. Remeasurements on three sets of representative plots are now available. Because of the extensive cultural work being carried on by the C. C. C. camps

---

* This is a brief resume of a longer article to be published by the University of Michigan.

** Professor of Silviculture, School of Forestry and Conservation, University of Michigan.

*** Silviculturist, Lake States Forest Experiment Station, U. S. Forest Service.

in plantations and in young natural stands, there is a continuous demand for information on methods of stand improvement. It therefore seems desirable to make a preliminary report on these experiments, even though the later development of these stands may tend to modify some of the present conclusions. The following are the conclusions incorporated in a report which will be published later.

Conclusions

Release cuttings in mixed stands of aspen and young Norway pine are distinctly worth-while cultural operations. The young pines, even when badly suppressed by taller and more vigorous aspen, respond immediately to release in almost direct proportion to the degree of cover removal. Suppressed trees benefit most by such cuttings. The early reaction of the trees released is to increase their diameter and become stockier rather than to increase their rate of height growth.

On most dry, sandy sites, survival of white pine is enhanced during its early years by an overhead cover, but growth is retarded. After becoming established, the pine should be released in order to secure satisfactory growth. Its response to such a release is prompt and roughly proportional to the degree of release. However, a clear cutting of the overhead cover is undesirable because of the danger of increasing damage from weevils. Moreover, if the pine has been left so long as to become badly suppressed it is likely to die if uncovered too suddenly.

Underplanting of white pine on spots occupied by maple and juneberry is inadvisable because of the prolific sprouting of these species after cutting.

Heavy stands of aspen when clear cut produce a mass of suckers that offer worse competition to the pine than the original stand, unless the pine is large enough to keep ahead. Partial cutting will lessen the production of suckers very materially but follow-up release cuttings will be necessary if the pine is small.

Planting white pine under oak with subsequent release cutting is apt to be an expensive undertaking unless the overstory can be disposed of at a price sufficient to offset at least a large part of the cost of cutting. Underplanting should, therefore, be delayed until the oak has reached merchantable size.

Stands of medium, but rather uniform, stocking offer the best opportunity for successful underplanting with pine and subsequent release cutting of a partial character. When fully stocked stands are to be underplanted they should first be opened by removing as many as possible of the largest crowned trees in order to reduce damage to the pines in later release cuttings. Only enough cover should be left to protect the site and prevent serious trouble from the white pine weevil.

Where stands are already underplanted, and release cutting seems desirable, the cut should be made as soon as possible to reduce damage from breakage. Cutting in such cases should be done when the hardwoods are bare to reduce the danger of killing pines by burying them with slash.

When red oak is removed in a release cutting, treatment of the stumps with creosote will practically eliminate sprouting and the necessity for later cuttings. White oak that is forty years old or more has little or no sprouting ability in the northern portion of the Lake States.

Lopping and scattering of slash has proven to be satisfactory in all cases.